Catalogs of space weather events

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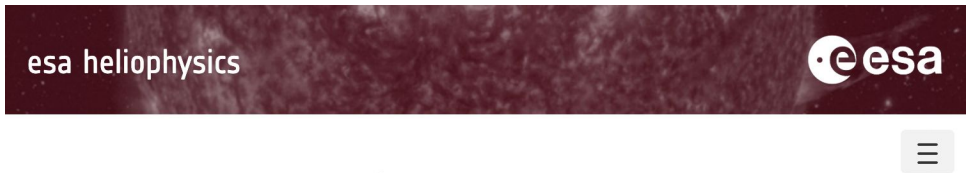


'Heliophysics in Europe and 1st European Heliophysics Community meeting'
19-21 November 2024 ONLINE

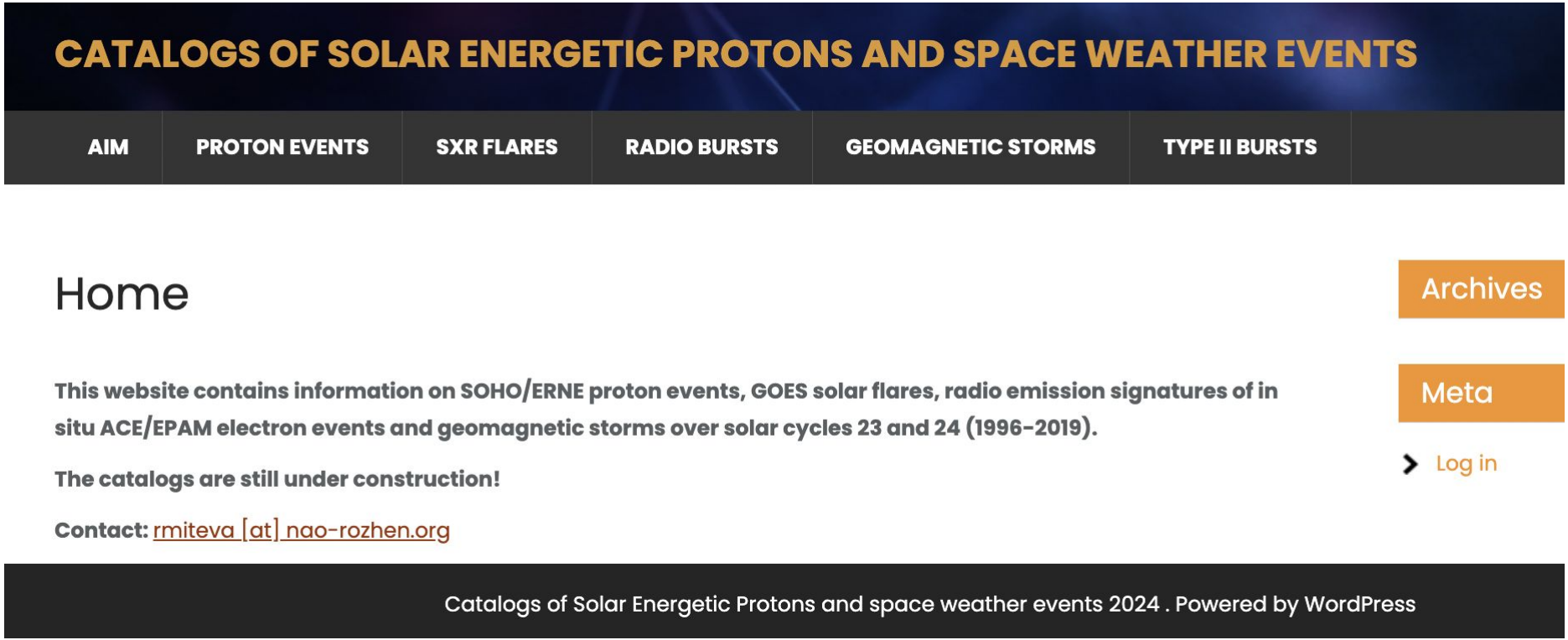
IANAO-BAS: facilities

Sofia
NAO-Rozhen
AO-Belogradchik

https://astro.bas.bg/

Catalogs of space weather events

https://catalogs.astro.bas.bg/



(under completion)

CATALOGS OF SOLAR ENERGETIC PROTONS AND SPACE WEATHER EVENTS

AIM | PROTON EVENTS | SXR FLARES | RADIO BURSTS | GEOMAGNETIC STORMS | TYPE II BURSTS

Solar Cycle 23 – Protons

https://catalogs.astro.bas.bg/

Abbreviations:

- AW – angular width (in degrees)
- CME – coronal mass ejection
- gap – data gap
- no – no proton event
- SF – solar flare
- u – uncertain

Notations:

- all times are in UT
- Channels (in MeV): **1**: 14-17; **2**: 17-22; **3**: 21-28; **4**: 26-32; **5**: 32-40; **6**: 40-51; **7**: 51-67; **8**: 64-80; **9**: 80-101; **10**: 101-131
- class: flare peak in GOES soft X-ray flux; C-class: *10^(-6) (W/m^2)
- CME speed: linear speed (km/s) from https://cdaw.gsfc.nasa.gov/CME_list/index.html
- flare latitude: North (positive); South (negative)
- flare longitude: West (positive); East (negative)
- SEP peak intensity: protons/(cm^2 sr s MeV)

Show 10 entries

Search:

Year	m	d	C-class	SF start	SF max	lat	long	CME onset	CME speed	CME AW	onset UT	peak UT	Channel 1	Channel 2	Channel 3	Channel 4	Channel 5	Channel 6	Channel 7	Channel 8	Channel 9	Channel 10
1996	7	9	260	09:05	09:11	-10	30	gap	gap	gap	10:13	11:03	0.004401	0.002427	0.001022	0.000979	no	no	no	no	no	no
1996	8	13	u	u	u	u	u	16:09	620	153	18:33	24:19	0.008504	0.005586	0.002268	0.001914	0.00121	0.000892	no	no	no	no
1996	11	26	0.9	20:48	24:32	u	u	21:36	548	78	24:39	28:49	0.001545	0.000702	0.000657	no	no	no	no	no	no	no

(under completion)

Wind/EPACT
proton event catalog

 Last modified 01/10/2019 21:00:15

Solar cycle 23: 1996-2008 | Back to list of Catalogs | Solar cycle 24: 2009-2018

Search among all events from 1996 to 2018

This catalog lists the proton enhancements from the Wind/EPACT instrument since 1996 in the two energy channels available. The catalog is organized as a table that presents the solar energetic particles (protons) observed during solar cycle 23 (1996-2008) and the ongoing solar cycle 24 (since 2009). The catalog provides the following information: onset, peak times (in UT) and peak proton intensity at 19÷28 energy channel and also the peak proton intensity at 28÷72 MeV energy channel. In addition, the solar sources (flares and coronal mass ejections, CMEs) of the proton events are identified, where possible, with their properties noted. Further information is given as a comment.

Extensions of the catalog (or corrections if needed) will appear regularly online.
For preliminary description and results of the catalog, see Miteva et al. (2016) and Miteva et al. (2017)

Explanatory notes:

Proton data: from CDAweb database provided with 92-sec time resolution.
Onset time: identified as the time of 3-sigma intensity value above pre-event level.
Peak time: identified at the maximum of the particle profile (local enhancements are not considered).
J_p: peak proton intensity after subtraction of the pre-event level.
F_p: onset-to-peak proton fluence.

The reported here onset/peak times and J_p are based on 5-point smoothed data.

Abbreviations:
N/A: onset not found and/or it was fully masked by previous ongoing event
nd: next day
pd: previous day
p: peak is poorly defined
SXR: soft X-ray
u: uncertain
v: visual

If you want to use the data in a paper, book, or any other kind of electronic publication, please give credit to **Wind/EPACT proton event catalog** http://newserver.stil.bas.bg/SEPcatalog/ together with the dedicated catalog paper: *R. Miteva, S. W. Samwel* and *M. V. Costa-Duarte* **The Wind/EPACT Proton Event Catalog (1996-2016)** (2018) Solar Physics, 293: 27 [DOI:10.1007/s11207-018-1241-5].

Acknowledgements:
We use proton data provided by: CDAweb database;
flare information from: GOES flare listings and www.Solarmonitor.org;
and CME information from: CDAW LASCO CME catalog.

Contact: R. Miteva

Links: Space Climate Group Homepage
Space Research and Technology Institute Homepage

http://www.stil.bas.bg/SEPcatalog/

Wind/EPACT
proton event catalog

Solar cycle 23: 1996-2008

 Last modified 01/21/2019 11:49:21

Back to list of Catalogs | Back to Wind/EPACT | Solar cycle 24: 2009-2018

Event date	19-28 MeV			28-72 MeV	Flare	CME	Comment
yyyy-mm-dd	onset time (UT)	peak time (UT)	J_p (cm^2 s sr MeV)$^{-1}$/ F_p (cm^2 sr MeV)$^{-1}$	J_p (cm^2 s sr MeV)$^{-1}$/ F_p (cm^2 sr MeV)$^{-1}$	SXR class/ onset time (UT)/ location	time (UT)/ speed (km s^{-1})/ width (deg)	
1996-10-04	11:17	12:15	0.3006/416	0.0042/u	uncertain	03:15/255/28	
1996-11-30	11:32	12:32	0.0089/37	-	M1.0/20:16^{pd}/S06W47	uncertain	
1996-12-24	14:50	15:58	0.0092/39	0.0010/7	C2.1/13:03/N05W95^{v}	13:29/325/69	
1997-04-07	17:43	23:39	0.0118/254	0.0014/26	C6.8/13:50/S30E19	14:27/878/360	
1997-05-12	07:59	12:05	0.0202/249	0.0031/30	C1.3/04:42/N21W09	05:30/464/360	
1997-05-21	N/A	00:33nd	0.0040/u	0.0006/u	M1.3/20:03/N05W12	21:01/296/165	
1997-07-25	N/A	00:43nd	0.0083/u	0.0009/u	uncertain	21:01/611/84	
1997-09-09	-	-	-	-	-	-	data gap
1997-09-24	N/A	07:28	0.0059/u	0.0017/17	M5.9/02:43/S31E19	03:38/532/76	
1997-09-24	N/A	11:11	0.0048/u	0.0013/u	uncertain	uncertain	
1997-10-07	15:59	16:39	0.0108/30	0.0012/3	uncertain	13:30/1271/167	
1997-11-04	07:03	13:34	0.9518/13186	0.2148/1069	X2.1/05:52/S14W33	06:10/785/360	
1997-11-06	13:02	02:19nd	18.13/gap	2.933/gap	X9.4/11:49/S18W63	12:11/1556/360	
1997-11-13	23:34	02:25nd	0.0365/362	0.0060/17	uncertain	22:26/546/288	
1997-11-14	N/A	16:47	0.0101/u	0.0014/u	C4.6/09:05/N21E70	10:14/1042/86	u
1998-01-26	N/A	04:21nd	0.0050/u	0.0005/u	M1.3/21:26^{pd}/N22E53	22:20^{pd}/596/84	u
1998-04-05	23:36	08:32nd	0.0080/344	0.0007/u	uncertain	uncertain	p, u

(external catalog)

ACE/EPAM
Electron Event Catalog

@ NRIAG

Last modified 25/05/2021

Solar cycle 23: 1996-2008 | Solar cycle 24: 2009-2019

This catalog lists the electron enhancements from the ACE/EPAM instrument since 1997 in two energy channels. The catalog is organized as a table that presents the solar energetic particles (electrons) observed during solar cycle 23 (1996-2008) and solar cycle 24 (2009-2019). The catalog provides the following information: onset, peak times (in UT), peak electron intensity, and onset-to-peak electron fluence at 103-175 keV energy channel and also the peak electron intensity, and the onset-to-peak fluence at 175-315 keV energy channel. In addition, the solar sources (flares and coronal mass ejections) of the electron events are identified, where possible, with their properties noted. Furthermore, intensity and onset-to-peak fluence of the the associated solar energetic proton events (which have the same solar origin of the solar energetic electrons) at two energy channels; 19-28 MeV and 28-72 MeV, are listed. The properties of proton events are taken from Miteva R., Samwel S.W., Costa_Durate M.V., The Wind/EPACT Proton Event Catalog (1996-2016), 2018, Sol. Phy., 293: 27. Further information is given as a comment. Extensions of the catalog (or corrections if needed) will appear regularly online.

- **Explanatory notes:**
  - **Electron data**: from CDAweb database provided with 12-sec time resolution.
  - **Onset time (UT)**: identified as the time of 3-sigma intensity value above pre-event level.
  - **Peak time (UT)**: identified at the maximum of the particle profile (local enhancements are not considered).
  - J_e (cm^2 s sr keV)$^{-1}$: peak electron intensity after subtraction of the pre-event level
  - F_e (cm^2 s sr keV)$^{-1}$: Onset- to- peak electron fluence
  - J_p (cm^2 s sr MeV)$^{-1}$: Peak proton intensity after subtraction of the pre-event level
  - F_p (cm^2 s sr MeV)$^{-1}$: Onset- to- peak proton fluence
  - The reported here onset/peak times and J_e are based on 5-point smoothed data.
- **Abbreviations:**
  - **no**: no event identified
  - **nd**: next day
  - **pd**: previous day
  - **u**: uncertain
  - **gap**: data gap
  - **v**: Visual

If you want to use the data in a paper, book, or any other kind of electronic publication, please give cred

- **Acknowledgements**:
  - We use electron data provided by: CDAweb database
  - flare information from: GOES flare listings and Solarmonitor.org
  - CME information from: CDAW LASCO CME catalog
- **Links:**
  - National Research Institute of Astronomy and Geophysics (NRIAG)
  - http://newserver.stil.bas.bg/SEPcatalog/index.html
  - This Database was done under SCOSTEP VarSITI scientific program with the project 'Solar energetic electron: 'On the relationship between major space weather phenomena in solar cycle 23 and 24.

https://www.nriag.sci.eg/ace_electron_catalog/

ACE/EPAM
Electron Event Catalog

Solar cycle 23: 1996-2008

@ NRIAG 2021

Last modified 25/05/2021

Back to: Home Page | Solar cycle 24: 2009-2019

Date			Electrons		103-175 keV		175-315 keV		GOES SXR Flare				SOHO/LASCO CME				19-28 MeV		28-72 MeV		Comments
yyyy	mm	dd	Onset	Peak	J_e	F_e	J_e	F_e	Onset	Peak	Class	Location	time	Speed	AW	MPA	J_p	F_p	J_p	F_p	
1997	9	9	20:59	23:00	97.897655	667146	41.631	103008	20:04	20:11	B7.1	u	20:06	726	101	303	no	no	no	no	
1997	9	18	00:41	01:00	294.480444	291933	39.422	43255	17:45^{pd}	18:03^{pd}	M1.0	N21W84	20:29^{pd}	377	360	263	no	no	no	no	
1997	9	18	19:13	22:29	378.120216	2326729	no	no	17:05	17:10	C1.5	N22W91^{v}	18:03	285	55	268	no	no	no	no	
1997	9	20	03:45	06:22	291.9095	2027564	37.457	57980	00:27	00:48	B8.0	u	00:44	522	39	247	no	no	no	no	Occulted SF

(external catalog, collaboration)

Summary

- Overview of their instrument / network / project and their expertise and scientific research field

Space weather topics (SEPs, geomagnetic storms, space weather influence on satellites)

- Personal experience of coordinating ground to space (challenges, successes, ideas)

Statistical studies on solar energetic particles, radio emissions and geomagnetic storms

- questions / ideas to discuss with the audience – related to experiences when trying to do any co-ordination or other comments to the community

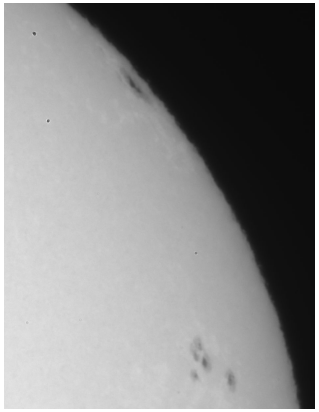
(1) Do the heliospheric/space weather communities need event catalogs
(particles, flares, geomagnetic storms and their mutual associations)?
(2) What information do you need from such catalogs?
date, time, intensity, location, correlation with other phenomena

Solar observations in Bulgaria

Celestron C11 (Schmidt-Cassegrain optics, diameter 11” (28 cm), focal length 2800 mm, f/10

Credit: images by Pencho Markishki

First test images at AO-Belogradchik (14-Oct-2024)



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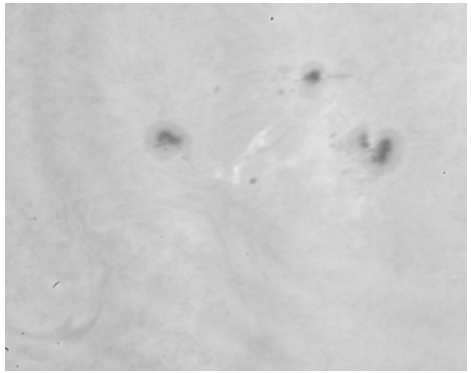
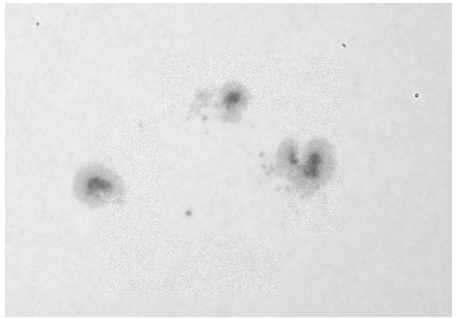
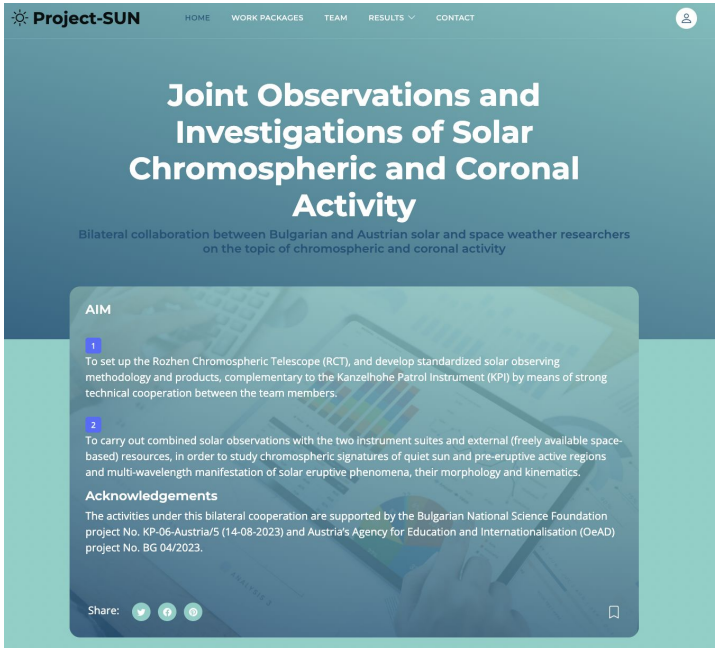




https://astro.bas.bg/project-sun/



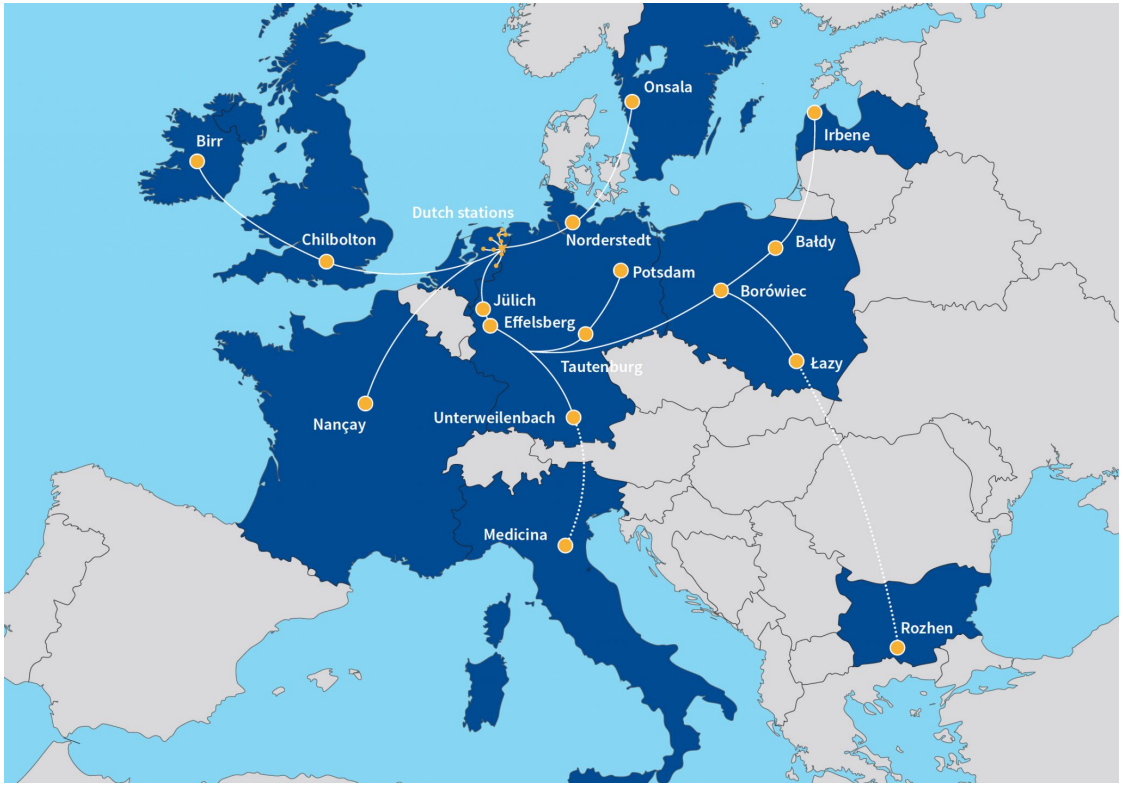
- resolution is sufficient to resolve details
- seeing conditions were bad (wiggly limb), but umbra and penumbra well separated
- filter not in center of line, artefacts
- small flare is visible
- filament is visible
- chromospheric network is visible

LOFAR-BG

https://lofar.bg/

The LOFAR-BG project foresees to build and develop:

- Bulgarian observational station of the LOFAR telescope
- human potential for carrying out specialized astrophysical and geophysical research with the LOFAR-BG station and the entire LOFAR telescope
- development of scientific and engineering potential, for enabling the hardware and software support for the telescope



LOFAR-BG is part of the National Roadmap for Scientific Infrastructure (2020-2027), coordinated by the Ministry of Education and Science of Bulgaria (contracts D01-389/18.12.2020 and D01-177/29.07.2022)

(in progress)

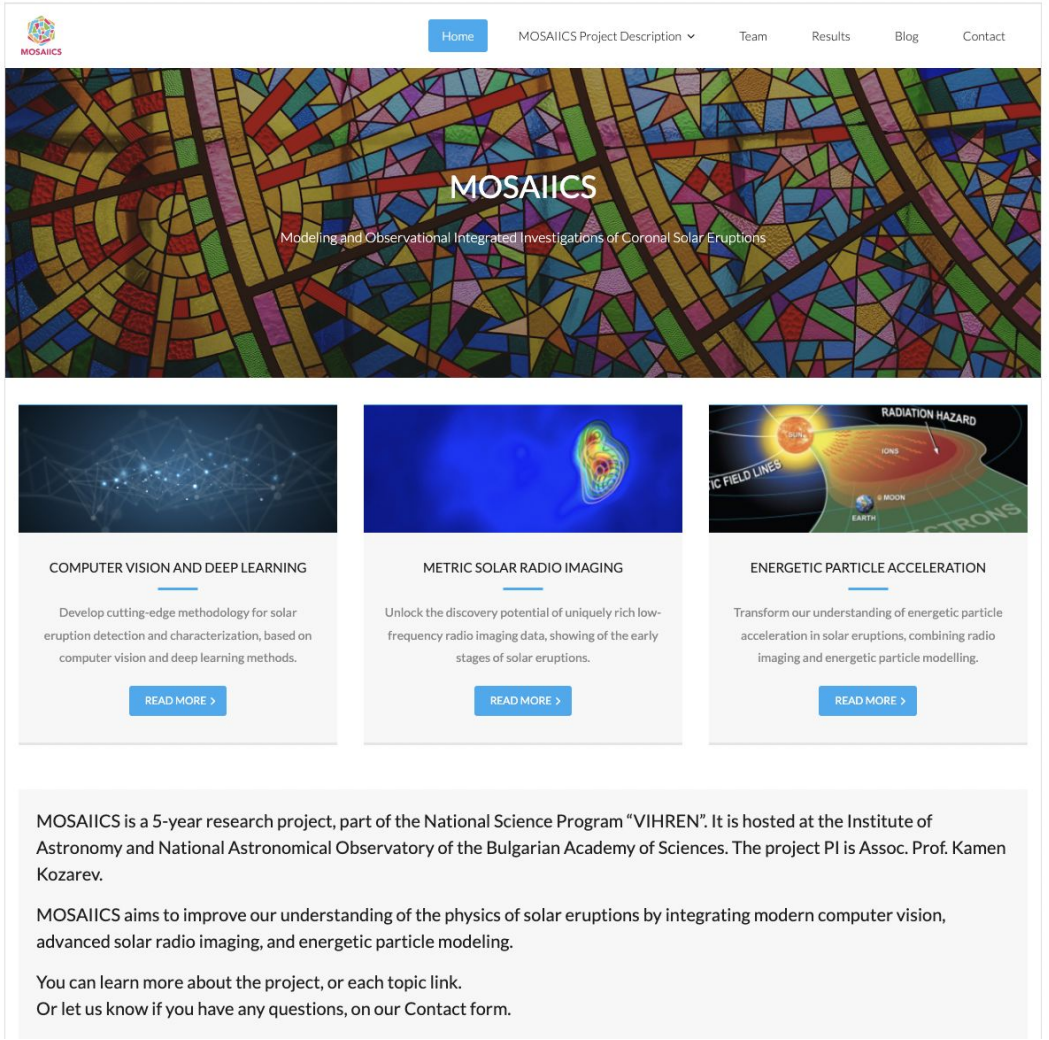
MOSAIICS

Modeling and Observational Integrated Investigations of Coronal Solar Eruptions

(Bulgarian National Science Fund)

https://mosaiics.astro.bas.bg/

(in progress)



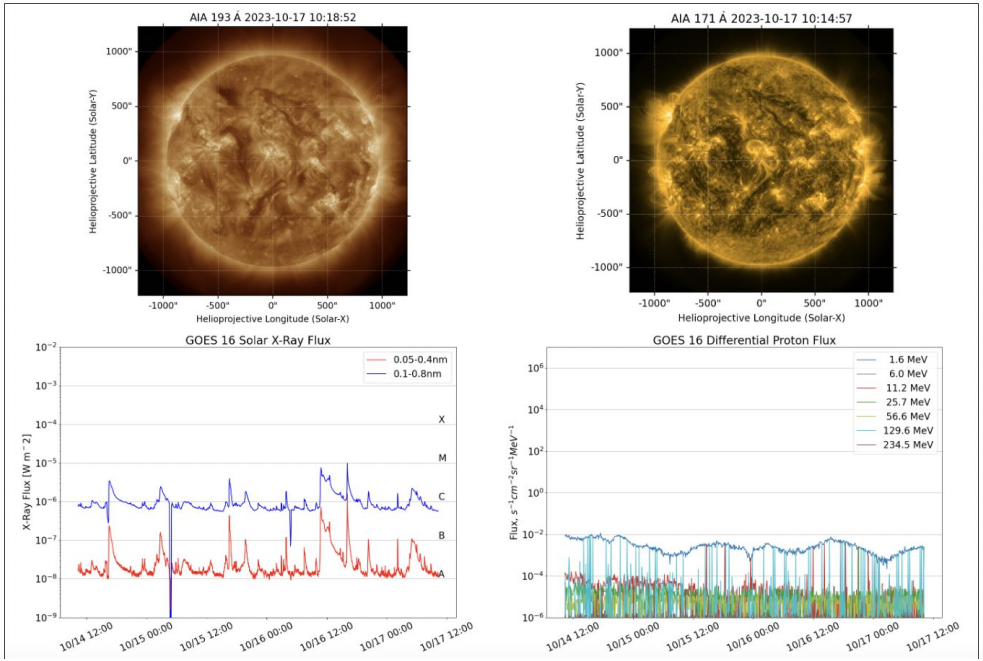
SPREADFAST

https://spreadfast.astro.bas.bg/synoptic/

SPREAdFAST Near-Realtime Monitor of Early-Stage SEP Events

SPREAdFAST webpage | SPREAdFAST historical events | SPREAdFAST Logger App (Log-in required)

Near-Realtime Space Weather (Data from NASA/NOAA)



Prototype of a **forecasting** system, based on physics-based model for acceleration of solar energetic particles and their transport to Earth

(ESA project)

featured in a SEP review (Whitman et al. 2023)

(completed)

Bilateral collaborations

Regional:

- Serbia

Active events on the Sun, ***catalogs of proton events*** and electron signatures…

Europe:

- Netherlands & Ireland (LOFAR)
- Austria (optical, space weather)

The ***origin of solar energetic particles***: solar flares vs. coronal mass ejections
solar chromospheric and ***coronal activity***

Worldwide:

- India (radio bursts)

Eruptions, flows and waves in the solar atmosphere and their ***influences on the space weather***

- Egypt (space weather)

relationship between major ***space weather phenomena*** in solar cycles 23 and 24
space weather effects at near Earth environment - from remote observations and in situ particle forecasting to impacts on satellites

http://edu-pro.astro.bas.bg/sun/?page_id=368

Acknowledgements

☼SCOSTEP/PRESTO 2020 grant https://scostep.org/presto/
'On the relationship between major space weather phenomena in solar cycles 23 and 24'

☼Interacademy bilateral projects (BAS)

- Bulgaria-Egypt 'On space weather effects at near Earth environment - from remote observations and in situ particle forecasting to impacts on satellites' IC-EG/08/2022-2024'
- Bulgaria-Serbia 'Active Events on The Sun. Catalogs of Proton Events and Electron Signatures in X-Ray, UV and Radio Diapason…'

☼Bulgarian National Science Fund https://bnsf.bg/

- Bulgaria-Austria 'Joint observations and investigations of solar chromospheric and coronal activity' KP-06-Austria/5 (14-08-2023)
- MOSAIICS 'Modeling and Observational Integrated Investigations of Coronal Solar Eruptions', Vihren project, KP-06-DV-8/18.12.2019

☼European Space Agency (ESA): https://spreadfast.astro.bas.bg/

☼EU-Horizon 2020 (twinning project/No 952439): STELLAR (Scientific and Technological Excellence by Leveraging LOFAR Advancements in Radio Astronomy)

☼Ministry of Education, Bulgaria: LOFAR-BG https://www.mon.bg/en/bg/

SCOSTEP
Scientific Committee on Solar-Terrestrial Physics

1869

PRESTO

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